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List of Abbreviations:

ALT	Aspartate aminotransferases
AST	Alanine aminotransferases
Ang1	Angiopoietin 1
α-SMA	Alpha-smooth muscle actin
$AUC_{0-\infty}$	Area under the curve from zero to infinity
BiPPB	Bicyclic PDGFβR-recognizing peptide
CCl_4	Carbon tetrachloride
CD	Cluster of differentiation
CXCR4	CXC Chemokine receptor 4
DAPI	4',6-diamidino-2-phenylindole
DMF	Dimethyl formamide
ECM	Extracellular matrix
eNOS	Endothelial nitric oxide synthase
FCS	Fetal calf serum
FITC	Fluorescein isothiocyanate
GAPDH	Glyceraldehyde 3-phosphate dehydrogenase
GMBS	N-[γ-maleimidobutyryloxy] succinimide ester
HE	Hematoxylin
HSCs	Hepatic stellate cells
HSA	Human serum albumin
IDO-I	Indoleamineopyrrole 2,3-dioxygenase-I
IFNα	Interferon alpha
IFNβ	Interferon beta
IFNγ	Interferon gamma
IFNγR	Interferon gamma Receptor
Ig	Immunoglobulin
IL	Interleukin
Mal-PEG-SCM	Maleimide-PEG-succinimidyl carboxy methyl ester
MFs	Myofibroblasts
MHC-II	Major histocompatibility complex-II
MimIFNγ	Mimetic Interferon gamma

MIP2	Macrophage inflammatory protein 2
MMPs	Matrix metalloproteinases
mPEG-SMB	PEG-succinimidyl α-methylbutanoate
NET	Norepinephrine transporter
NO	Nitric oxide
PAS	Periodic acid schiff's base
PBS	Phosphate buffered saline
PDGF	Platelet derived growth factor
PDGFβR	Platelet derived growth factor beta receptor
PEG	Polyethylene glycol
PPB	PDGFβR-recognizing cyclic peptide
SATA	N-succinimidyl-(acetylthio)-acetate
SDF1α	Stromal cell-derived factor 1 alpha
STAT1α	Signal transducer and activator of transcription 1 alpha
Th	T helper
TIMPs	Tissue Inhibitor of metalloproteinases
TRITC	Tetramethyl Rhodamine Isothiocyanate
TNFα	Tumor necrosis factor alpha
VEGF	Vascular endothelial growth factor

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Education and Research Experience

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- *Project title:* The role of HCV proteins and alcohol in the pathogenesis of HCV-induced fibrogenesis.
- *EASL Sheila Sherlock research fellowship* granted by European Association for the study of the liver.

Ph.D. (Sept. 2007-June 2011): University of Groningen, The Netherlands

- *Thesis title:* Re-direction of Interferon gamma and its signalling moiety: new options for the therapy of chronic diseases.
- *Ubbo Emmius Fellowship from Dutch Ministry of Foreign Affairs. Project Advisors:* Prof. Klaas Poelstra (Supervisor), Dr. Jai Prakash (Co-supervisor), Dr. Leonie Beljaars (Co-supervisor).

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Junior Research fellow (2002-2004): All India Institute of Medical Sciences, Delhi, India.

- *Project titles:* (a) Occult hepatitis B virus infection in chronic liver disease: full-length genome and analysis of mutant surface promoter. (b) Sequence analysis of Hepatitis E virus 3' terminal sequences from blood donors, patients and animals.
- *Junior Research fellowship* granted by Council for Scientific and Industrial Research (CSIR), India. *Project Advisors:* Prof. Subrat Kumar Panda (Department of Pathology) and Prof. Subrat Kumar Acharya (Department of Gastroenterology).

M.Sc (Honors) in Biochemistry (2000-02): Delhi University, Delhi, India.

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- *Master thesis titles*: (a) Liposome mediated delivery of Ricin in CHO cells and Effects of Various lysosomotropic agents; (b) Expression, phage display and mapping of HIV P24 protein.

B.Sc (Honors) in Biochemistry (1997-2000): Sri Venkateshwara College, Delhi University, New Delhi, India.

Awards

- *EASL Young Investigator bursary award***,** European Association for the Study of the Liver (EASL) monothematic conference 2011 held in Petersburg, Germany.
- *EASL Young Investigator bursary award***,** International Liver Congress, EASL 2011 held in Berlin, Germany.
- *Nominated from University of Groningen (RUG)* for Netherlands Federation of Innovative Drug Research (FIGON) National PhD competition 2010.
- *2nd Best Poster Presentation award* at FIGON Dutch Medicine Days 2010, Lunteren, The Netherlands.
- *EASL Young Investigator bursary award***,** International Liver Congress, EASL 2010 held in Vienna, Austria.
- *Young Investigator travel Grant* from Department of Biotechnology (DBT), Ministry of Science and technology, India for attending 12th ISVHLD 2006, Paris, France.
- *Council of Scientific and Industrial Research (CSIR) research fellowship* from 2002 - 2007.
- *Received Indira Gandhi Memorial award for second university rank in B. Sc. (H) Biochemistry* in 2000, by Delhi University, India.
- *Received Shri Nari Mirchandani memorial prize (1995-1996) for scoring highest percentage in Biology*.
- *Received Merit cum means cash award (1994-1995)* in class XI.
- *Awarded membership of the European Association for the study of the liver (EASL), Switzerland, 2010-2012.*

Fellowships

- *EASL Sheila Sherlock Research Fellowship* from June 2011 – May 2012 awarded for Postdoctoral research at karolinska Institutet at Karolinska University Hospital Huddinge in Stockholm, Sweden.
- *Ubbo Emmius International fellowship* from Sept 2007 – August 2011 to pursue PhD at the University of Groningen, The Netherlands.
- *Council of Scientific and Industrial Research (CSIR) research fellowship* from August 2002 – July 2007 for research at AIIMS, Delhi, India.
- *Awarded IndusInd fellowship, IndusInd Foundation, India* for the University Education *(1997-2000).*

List of publications:

From this thesis

- **Bansal R**, Post E, Proost JH, de Jager-Krikken Alie, Poelstra K, Prakash J. PEGylation improves pharmacokinetic profile, liver uptake and efficacy of Interferon gamma in liver fibrosis. *Journal of Controlled Release 2011; 154 (3): 233-240.*
- **Bansal R**, Prakash J, Post E, Beljaars L, Schuppan D, Poelstra K. Novel engineered targeted Interferon gamma blocks hepatic fibrogenesis in mice. *Hepatology 2011; 54 (2): 586-96.*

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  Highlighted as "key scientific article" in Global Medical Discovery.
- **Bansal R**, Prakash J, de Ruiter M, Beljaars L, Poelstra K. Peptide-modified albumin carrier explored as the targeted approach to deliver interferon gamma for the treatment of liver fibrosis. *Molecular Pharmaceutics 2011; 8 (5): 1899-1909.*
- **Bansal R**, Tomar T, Ostman A, Poelstra K, Prakash J. Selective targeting of interferon gamma to stromal fibroblasts and pericytes as a novel therapeutic approach to inhibit angiogenesis and tumor growth *Molecular Cancer Therapeutics (Accepted).*
- **Bansal R**, Prakash J, de Ruiter M, Beljaars L, Poelstra K. Targeted delivery of Interferon gamma peptidomimetic inhibits chronic hepatic fibrosis and tumor angiogenesis in vivo *(Submitted).*
- **Bansal R**, Prakash J, de Ruiter M, Poelstra K. Recombinant engineered HSC-specific targeted fusion proteins of IFNγ and mimetic IFNγ with PDGFβR bicyclic peptide inhibits liver fibrosis *in vivo (Manuscript in Preparation).*

Other publications

- Prakash J, **Bansal R**, Post E, de Jager-Krikken A, de Hooge, MH, Poelstra K. Albumin-binding and tumor vasculature determine the anti-tumor effect of 15-deoxy-delta^{12,14}-Prostaglandin-J_2 in vivo. *Neoplasia. 2009; 11(12): 1348-58.*
- Gupta P, **Tayal R**, Durgapal H, Rath S, Acharya SK, Panda SK. Development of highly sensitive Bicistronic vector based non-radioactive antigen-specific cytotoxicity assay. *Journal of Immunological Methods 2009; 349(1-2): 28-37.*
- Chaudhuri V, **Tayal R**, Nayak B, Acharya SK, Panda SK. Occult hepatitis B virus infection in chronic liver disease: full-length genome and analysis of mutant surface promoter. *Gastroenterology 2004; 127(5): 1356-71.*

Patent

Bansal R, Poelstra K, Prakash J, Beljaars L. Interferon-gamma analogues for the treatment of liver fibrosis. *Issued on Jan 2010. European patent application (EP*

09181049.9); US application (US 61/302973) and PCT application (PCT/NL2010/050897).

Published abstracts

- **Bansal R**, Prakash J, Ruijter M De, Post E, Beljaars L, Poelstra K. A novel interferon gamma peptidomimetic inhibits early and progressive liver fibrogenesis in vivo. *Hepatology (2011); 54 (suppl. 4): 732A*. *Selected as AASLD Presidential Poster of Distinction.*
- Prakash J, **Bansal R**, Tomar T, Ostman A, Poelstra K. Targeting of Interferon gamma to stromal fibroblasts using a PDGF receptor recognizing carrier reduces tumor growth in vivo". *European Journal of Cancer 2011; 47 (suppl. 1): S217.*
- **Bansal R**, Prakash J, Ruiter M de, Post E, Beljaars L, Poelstra K. Delivery of the Interferon gamma signaling moiety to the PDGFβ-receptor on Hepatic Stellate Cells ameliorates established liver fibrosis in mice. *Journal of Hepatology (2011); 54 (suppl. 1): S419. Selected by editorial panel as "poster of the week" and "most viewed poster of the month" by F1000 posters. F1000 Research 2011,* ***2,*** *1056 (poster)*
- **Bansal R**, Prakash J, Post E, Beljaars L, Poelstra K. Resolution of advanced liver fibrosis by targeted delivery of interferon gamma to hepatic stellate cells using a PDGFβR-recognizing cyclic peptide: improved therapeutic efficacy and no adverse effects. *Hepatology (2010); 52 (suppl. 1): 1264A – 65A.*
- **Bansal R**, Prakash J, Proost JH, Post E, Jager-Krikken A de, Beljaars L, Poelstra K. Anti-fibrotic effects of PEGylated interferon gamma in vitro and in vivo in acute CCl_4-induced liver injury mouse model: Therapeutic efficacy and adverse effects. *Hepatology (2010); 52 (suppl. 1): 1282A.*
- **Bansal R**, Prakash J, Post E, Beljaars L, Poelstra K. Cell-Specific Targeting of Interferon Gamma to hepatic stellate cells using a cyclic PDGF-receptor recognizing peptide improves its therapeutic efficacy. *Journal of Hepatology (2010); 52 (suppl. 1): S354-S355.*
- **Tayal R**, Durgapal H, Acharya SK, Panda SK. Development of Non-radioactive antigen-specific reporter release T-cell cytotoxicity assay. *Hepatology International 2007; 1 (suppl. 1): P920.*
- **Tayal R**, Durgapal H, Satpathy G, Acharya SK, Panda SK. Development of bicistronic selectable vector for non-radioactive antigen specific reporter release T-cell cytotoxicity assay. *Journal of Clinical Virology 2006; 36 (suppl. 2): S158.*
- **Tayal R**, Thakral D, Durgapal H, Dixit R, Acharya SK, Panda SK. Sequence analysis of hepatitis E virus 3' terminal sequences from blood donors, different diseased patients and animals. *Journal of Gastroenterology and Hepatology 2004; 19 (suppl. 7): A821.*

Oral Presentations

- Targeted interferon gamma and mimetic interferon gamma explored as potential therapeutics for the treatment of liver fibrosis. *EASL monothematic conference 2011 at Petersberg, Germany, June 17th – 18th, 2011.*
- Cell-specific delivery of Interferon gamma in the fibrotic liver; therapeutic effciciency and adverse effects. *Dutch Science Liver Retreat (DSLR) at Westerbork, Netherlands, October 14th - 15th, 2010.*
- Liver-specific targeting of Interferon gamma to hepatic stellate cells inhibits advanced liver fibrosis in mice with potentially reduced side effects. *FIGON Dutch Medicine Days at Lunteren, Netherlands, October 4th - 6th, 2010.*
- A novel hepatic stellate cell targeted chimeric peptide of mimetic IFNγ inhibits liver fibrosis in acute CCl4-induced liver injury mouse model. *4th European Club for Liver Cell Biology (ECLCB) meeting, Castillo de Javier, Pamplona, Spain, September 30th - 2nd October 2010.*
- Liver-specific targeting of Interferon gamma to hepatic stellate cells inhibits experimental liver fibrosis in mice with potentially reduced side effects. *GUIDE Early Summer Meeting, Groningen, Netherlands, June 10, 2010.*
- A mimetic peptide of Interferon gamma (IFN gamma) as a novel anti-fibrotic agent. *Keystone Symposia Conference, Fibrosis (J2), at Keystone, Colorado, USA, January 20th - 25th, 2009.*
- Liver-selective delivery of Interferon gamma for the treatment of liver fibrosis. *GUIDE Early Summer Meeting, Groningen, Netherlands, June 5, 2008.*

Poster Presentations

- Targeted interferon gamma and mimetic interferon gamma explored as potential therapeutics for the treatment of liver fibrosis. *European Association for the Study of the Liver (EASL) monothematic conference 2011 at Petersberg, Germany, June 17th – 18th, 2011.*
- Delivery of the Interferon gamma signaling moiety to the PDGFβ-receptor on Hepatic Stellate Cells ameliorates established liver fibrosis in mice. *EASL International Liver Congress 2011 at Berlin, Germany, March 30th – April 3rd, 2011.*
- Resolution of advanced liver fibrosis by targeted delivery of interferon gamma to hepatic stellate cells using a PDGFβR-recognizing cyclic peptide: improved therapeutic efficacy and no adverse effects. *American association for study for liver diseases (AASLD) Liver meeting 2010 at Boston, USA, November 2010.*
- Anti-fibrotic effects of PEGylated interferon gamma in vitro and in vivo in acute

CCl_4-induced liver injury mouse model: Therapeutic efficacy and adverse effects. *American association for study for liver diseases (AASLD) Liver meeting 2010 at Boston, USA, November 2010.*

- Liver-specific targeting of Interferon gamma to hepatic stellate cells inhibits advanced liver fibrosis in mice with potentially reduced side effects. *FIGON Dutch Medicine Days at Lunteren, Netherlands, October 4th - 6th, 2010.*
- Liver-specific targeting of Interferon gamma to hepatic stellate cells inhibits experimental liver fibrosis in mice with potentially reduced side effects. *GUIDE Early Summer Meeting, Groningen, Netherlands, June 10, 2010.*
- Cell-Specific Targeting of Interferon Gamma to hepatic stellate cells using a cyclic PDGF-receptor recognizing peptide improves its therapeutic efficacy. *EASL International Liver Congress 2010 at Vienna, Austria, April 14th – 18th, 2010.*
- Intracellular delivery of Interferon gamma to human hepatic stellate cells using pegylated PDGF receptor specific carrier: A novel approach for the treatment of liver fibrosis. *GUIDE Early Summer Meeting, Groningen, Netherlands, June 4, 2009.*
- A mimetic peptide of Interferon gamma (IFN gamma) as a novel anti-fibrotic agent. *Keystone Symposia Conference, Fibrosis (J2), at Keystone, Colorado, USA, January 20th - 25th, 2009.*
- Liver-selective delivery of Interferon gamma for the treatment of liver fibrosis. *GUIDE Early Summer Meeting, Groningen, Netherlands, June 5, 2008.*